CLAIMS

What is claimed is:

1. A method for determining process species associated with plasma charging damage, the method comprising:

measuring a first set of optical emission spectra from a test wafer during a plasma process operation;

measuring a plasma charging voltage detected by the test wafer;

correlating the optical emission spectra with the plasma charging voltage; and

from the correlation identifying a molecular species contributing to the plasma charging voltage.

2. The method recited in claim 1, further comprising:

measuring a second set of optical emission spectra from a wafer; and

measuring a second plasma charging voltage on a test wafer before correlating the emission spectra with the measured plasma charging voltages.

3. The method recited in claim 1, wherein the test wafer is an EPROM wafer.

4. The method recited in claim 1, wherein the test wafer is a wafer reliability level wafer.

5. The method recited in claim 1, wherein identifying a species contributing to the plasma charging voltage comprises identifying the wavelengths of peaks in the optical emission spectra correlated with plasma charging voltage.

6. A method for adjusting plasma process parameters by monitoring the optical emission spectral output, the method comprising:

a) measuring a first optical emission spectrum correlated with plasma charging from a wafer during a plasma process step; and

b) adjusting a plasma process parameter in response to the measured first optical emission spectrum.

7. The method recited in claim 6 wherein the optical emission spectrum is measured using an optical spectrometer.

8. The method recited in claim 6 wherein the adjusting the process parameters comprises one of adjusting the RF level, the pressure for the species, and the flow rate for a species.

9. The method recited in claim 6 further comprising c) measuring the first optical emission spectrum correlated with plasma charging from a wafer during a plasma process step after the adjustment of the process parameter.

10. The method recited in claim 9 further comprising repeating steps a through c until the plasma charging is reduced.

11. The method recited in claim 9 further comprising repeating steps a through c until the plasma charging is minimized.

12. The method recited in claim 6 wherein the plasma process parameter is adjusted to reduce plasma charging damage to the wafer.

13. A method for monitoring plasma process variation, the method comprising:

performing a first and second measurement of an optical emission spectrum correlated with plasma charging from a wafer during a plasma process step;

comparing the first and second measurements to generate a comparison measure; and

determining whether the comparison measure exceeds a predetermined threshold.

14. The method recited in claim 13 wherein the first measurement is taken in a different plasma chamber from the second measurement.

15. The method recited in claim 14 wherein the first and second measurements are taken to match conditions in the chambers.

16. The method recited in claim 13 wherein the first measurement is taken in the same plasma chamber as the second measurement but at a different time than the second measurement.

17. The method recited in claim 13 further comprising, where the comparison measure exceeds the predetermined threshold, adjusting a plasma process parameter.

18. An apparatus for monitoring plasma process parameters to avoid plasma damage, the apparatus comprising:

a plasma chamber;

a spectrometer for determining optical emissions from the plasma chamber; and

a processor configured to correlate an optical emission spectrum with plasma charging values on the wafer.

19. The apparatus recited in claim 18 wherein the plasma chamber has a viewport for collecting optical emissions.

20. The apparatus recited in claim 18 further comprising an optical fiber guiding optical emissions from the plasma chamber to the spectrometer.

21. The apparatus recited in claim 18 further comprising a sensor for acquiring and storing the output from the spectrometer.

22. The apparatus recited in claim 18 wherein the processor is further configured to adjust the plasma process parameters in response to a comparison between the measured optical emissions and data correlating optical emissions with plasma charging.